The American Biology Teacher

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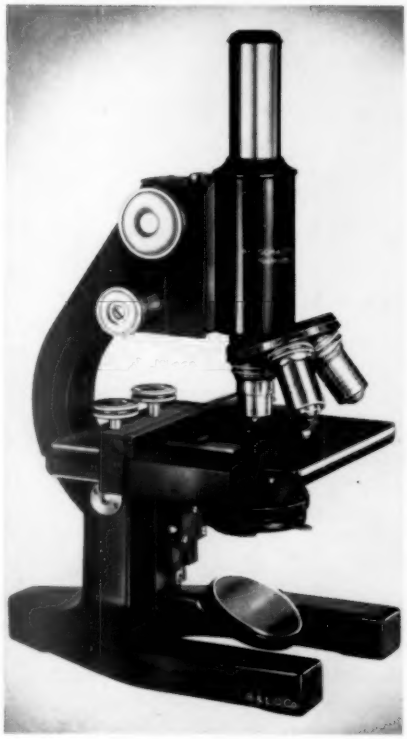

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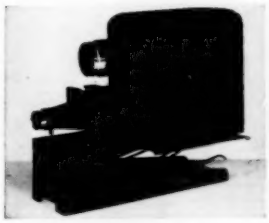

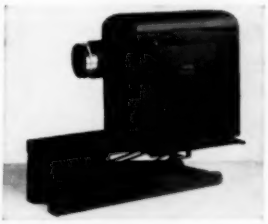

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THE AMERICAN BIOLOGY TEACHER

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The American Biology Teacher

Vol. 2 APRIL, 1940 No. 7

Living versus Dead Biology[1]

EDWIN G. CONKLIN
Emeritus Professor of Biology, Princeton University

Biology is generally defined as the science of life, or the science that deals with living things, but as it is frequently taught it might better be defined as the science of life with the life left out—necrology rather than biology.

I. The detailed study of the anatomy of dead animals lingers in my memory, as their smell lingers in my nostrils, when I think of my first laboratory course in biology. A classicist visiting that laboratory said, "Dead animals smell worse than the dead languages." Anatomy occupied a leading part in zoology courses, and I think the same was true of botanical ones, until near the beginning of the present century. It is said that Louis Agassiz, who was the teacher of many of the teachers of biology in America, used to assign to beginning students a preserved specimen of a fish with instructions to make a careful study of it, and when they reported to him in a short time he would send them back to do it more thoroughly and often kept them at it for several weeks. When I joined the faculty of the School of Biology at the University of Pennsylvania the beginning course in zoology was known as "the cat course," in which students were given a preserved cat and were expected to work out its anatomy after the manner of Agassiz. Only the most persistent students survived. We soon organized an introductory course in general biology, although the botanists insisted on its being called general zoology since they defined biology as "botany taught by a zoologist." We also had built for our zoological work a vivarium which was the counterpart of the botanist's greenhouse, and which was, I believe, the first such vivarium in America. It provided for keeping living representatives of all phyla and classes of the animal kingdom, for purposes of teaching and research. Anatomy is only a part, and in general, the least interesting part of biology for beginners. Of course it is necessary in any comprehensive course, but it should not occupy the chief place in an elementary course.

[1] Address before The National Association of Biology Teachers, Columbus, Ohio, December 29, 1939.

II. A great advance was made when the beginning course in biology included physiology as well as morphology. But here also there was too little study of real life as contrasted with mere mechanisms, such as muscle-nerve preparations, and the chemistry of digestion, respiration and excretion. Such physiology of organs and parts, like their morphology, is a necessary study for advanced students, but is less suitable for beginners. Scientific research does consist in "knowing more and more of less and less," in more complete analyses of the structure and function of systems, organs, tissues and cells, but it is important to begin such research only after having acquired a knowledge of whole organisms. It is said that an investigator at Woods Hole who had for two years studied the blood of *Limulus*, which was always brought to him in glass vessels, chanced to see for the first time a living *Limulus* in a tank and said, "For heaven's sake, what is that animal?"

III. Ecology, or old fashioned Natural History, is, in my opinion, the most interesting and important entrance into the science of life. Instead of everlasting analysis, seeing more and more of less and less, and consequently getting only fragmentary views of life, it deals with living, moving, feeling animals, with the organization (structure and function) of whole organisms, with their actual development, their food and manner of getting it, their enemies, friends and parasites, their mating, breeding and care of young, their daily and seasonal activities, their adaptations to new conditions, their behavior, instincts, habits. This is the study of real life, and it is the most fascinating and in recent times the most neglected aspect of biology.

Life is change, activity, movement. Animals as well as humans are interested in things that move, because they seem alive. The hawk sees the moving mouse, the mouse the moving cat. The charm of the cinema is that the pictures move and seem alive. The interest of children in living things is largely in what they do, and one of the chief charms of biology is in the activity of animals and plants.

IV. The laboratory study of living things is much more difficult than that of fixed and well preserved material, which can be kept in cans from year to year and can be studied with notes or directions that never need to be changed. The lazy or indifferent teacher will have little use for a course which requires constant care of living material and keen attention to its infinite variety. But it is worth all that it costs. Of course in limited laboratory space small organisms must be used. But the teacher has a great variety of these to choose from—protophyta and protozoa, algae, fungi, mosses and ferns; seeds, seedlings and potted plants; hydroids, worms and rotifers; phyllopods, copepods, decapods, snails; insects, fish and frogs, their eggs and embryos; tadpoles and embryo chicks. A vast variety of living material can be studied even in a city school, and in a great many ways, such as their anatomy, physiology, embryology, adaptations, regeneration and behavior. Such a study of living organisms is much more interesting and valuable than the study of their dead remains. Solomon said, "Better is a live dog than a dead lion," and a wise teacher of biology would say, "Better is a live paramecium than a dead dog."

V. Interest in biology is directly proportional to its humanization. Modern exact science has been so fearful of anthropomorphism, or the interpretation of animal behavior in terms of human behavior, that it has devitalized biology.

But to deny that animal behavior is akin to human behavior is to deny the fundamental postulates of evolution, and to regard animals as mere mechanisms is to affirm that man also is a mere mechanism; to deny feelings of satisfaction or dissatisfaction to lower animals makes it hard to explain their behavior and equally difficult to explain the behavior of higher animals and man.

Differential sensitivity and reactivity are present in all living things, they are the psychic elements in germ cells and embryos out of which develop the psychic phenomena of man, and there is good ground for assuming that some of this psychic development occurs in many animals other than man. The fear of anthropomorphism has gone to such unreasonable lengths that many analytical biologists deny that man is a self-conscious personality. Mind, consciousness, emotions, purposes are said to be delusions. But delusions of what, if not of these same phenomena; they can scarcely be delusions of delusions. I give it as my deliberate opinion that there is no more danger in interpreting animal behavior in terms of human behavior than in the reverse process; no more danger of error due to anthropomorphism in the study of amoeba than of amoeba-morphism in the study of man. When a sophisticated student once told Professor W. K. Brooks, of Johns Hopkins, that he treated his dog as if he were human, he replied, "If he feels more or less as I do it would be cruel to treat him otherwise, and if he does not have such feelings it will do no harm to treat him as if he did."

But of course it is possible to misinterpret both animal and human behavior. We all know that a dog fight is akin to a boy fight, but boys may misinterpret a crowd of paramecia or of ball fans as a fight when it is not. I once gave a lecture at a boy's reformatory on "Living things in a drop of water" and I projected on the screen a colony of living paramecia, and as these little animals swarmed in and out among one another, the boys rose up and shouted, "See 'em fight, See 'em fight." That was an anthropomorphic, or rather a pueromorphic misinterpretation, but not so great as it would have been to have interpreted a crowd of boys or paramecia as a swarm of dead, insensitive masses of matter, or a "fortuitous concourse of atoms."

A humanized biology regards all living things as fellow creatures. This is the great lesson of evolution. There is no other science that cultivates such a feeling of sympathy and fellowship with its objects of study. In this it resembles emotional disciplines such as poetry. The biologist can say with Coleridge:

> "He prayeth best, who loveth best
> All things both great and small."

And certainly the recognition of our fellowship with other living creatures deflates our egotism and broadens our sympathies.

VI. If there were time for it I should like to speak on "Living *versus* Dead Teachers," for it is perfectly evident to all of us that both kinds exist. Perhaps we are all only partly alive, both as organisms and as teachers, and can therefore say with Mrs. Browning, "All our life is mixed with death." But at least some teachers are more alive than others.

All good teaching is done in the spirit of discovery; the teacher and the student should be learners together. Of course, the teacher should be able to keep a little ahead of his students, but not so far ahead that he loses the learner's point of view.

I hold that the first duty of a teacher is not lecturing or the exhibition of erudition, but the furnishing of stimulus

to the student; the second duty is to lead by example, and the third and least is to impart knowledge. Inspiration, illumination, information are important in the order named. For the chief aim of all teaching should be character formation and the first aim of biology teachers should be to cultivate in students habits of (1) open eyes and open minds, (2) sincerity and love of truth, (3) sympathy with and appreciation of all that live. These habits are essential to peace and progress, and the cultivation of such habits is the chief hope of the future. In the cultivation of these habits few, if any, subjects are more important than humanized biology, and our profession is a high and holy calling.

Does Plant Pest Regulatory Work Concern the Biology Teacher?

H. F. SEIFERT, Chief Plant Inspector
Division of Plant Industry, Illinois State Department of Agriculture, Glen Ellyn, Illinois

The struggle of man for supremacy over insect pests has been going on for many years. Its intensity is due to the fact that economic pests constantly want the same things as man; things that are vital to the existence and survival of both. This struggle has gone on since pre-historic days and still continues. It will continue, undoubtedly, as long as the human race endures.

The realm of insectdom is all about us and anyone with keen eyes, alert mind and unrelenting patience has a rare reward in store for him in the study of entomology. When one observes that the realms of explorers include the earth's polar regions, the highest peaks, the most dangerous deserts and jungles, and deep seas, it is surprising that the wonders of the insect realm in our own dooryard, rich in trophies of new knowledge, are so generally overlooked. In insect life one finds a great diversity of habits, from the bizarre to the most amazing. Many notable contributions in this field have been made by such prominent entomologists as Comstock, Kellogg, Lutz, Wheeler, Fabre, Forel and numerous others.

When our ancestors were still living in primeval caves insect devastation was already rampant. Before man knew of a better anesthetic than a club the glowworm was able to administer an anesthetic to its unsuspecting victim that introduced profound stupor. The common bagworms were expert tailors when our ancestors were still dressing in crudely fashioned skins. When man had no understanding of the nervous system certain wasps knew how to paralyze their victims by stinging in certain ganglia, thereby keeping a fresh supply of food available for their offspring. Many other amazing examples of insect behavior could be cited.

To the layman, of course, all insects come under the classification of "bugs." Systematists, however, have divided the animal kingdom into vertebrates and invertebrates. Among the invertebrates we have one phylum designated as Arthropoda, which includes the class Hexapoda or all true insects. The class Hexapoda includes by far the largest number of species of all animal groups. It has been estimated that at least 75% of the animal

kingdom are insects. Approximately 700,000 species have been described and classified to date and the number of new species described each year averages around 6,000. The number of described species is only a small percentage of the entire class. Entomologists have estimated that there may be anywhere from 2,500,000 to 10,000,000 insect species in the world. Recognized entomologists list 23 well-known orders in the class Hexapoda, with 3 additional orders of extremely rare occurrence.

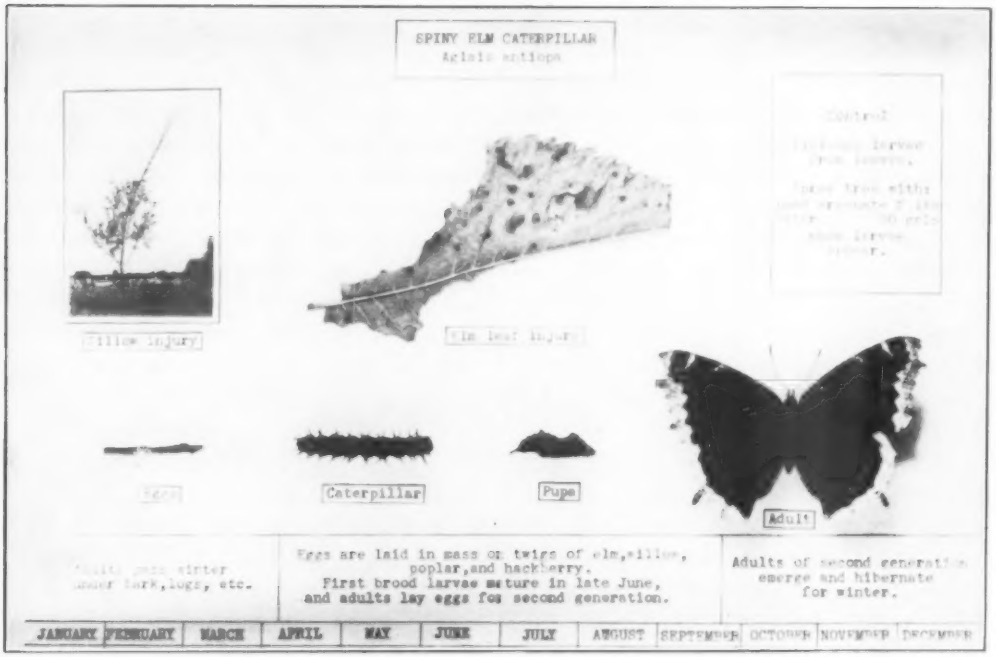
In view of the fact that the study of insect taxonomy is interesting we must not overlook the point that a great many of these insect species constitute a grave pest problem and are of extreme economic importance. The depredations of those species which constitute our recognized pest list are enormous. In 1924 for instance the estimated damage in the United States alone by insect pests amounted to $1,509,044,500. These losses included those to staple crops, vegetable crops, fruit crops, nursery and greenhouse crops, livestock, and economic losses by insects that carry human diseases.

What is being done to overcome these annual losses? Federal and State agencies are ever on the alert to curb the outbreaks of these pests and to prevent the introduction of new pests into the United States. There are many phases of control carried on incessantly by these agencies. One of them is concerned with the control of plant pests. Federal and State regulations are in effect at the present time to cope with this situation. Until 1912 no Federal regulations had been promulgated to prevent the introduction of new plant pests into this country. It is a well known fact that many of our most pernicious pests include introduced species. To overcome this the United States Plant Quarantine Act of 1912 was promulgated, after 14 years of effort to obtain authority to protect the United States from plant pests.

The several states have also promulgated plant inspection laws designed to prevent the introduction into and dissemination of plant pests within their respective states and to provide for their repression and control where they exist.

With the passage of laws by the different states regulating the movement of plant material it was soon discovered that there was such a multiplicity of requirements by the individual states that it became a burden to shippers to comply with all of the regulations. In order to simplify the regulations of the 48 states a number of plans were submitted to the regulatory officials to create a unified system of plant inspection and quarantine regulations. The plan finally adopted was the creation of district plant boards. The United States was divided into 4 regional groups consisting of the Eastern States, the Central States, the Southern States and the Western States. The officials of the states in these regional groups comprise the respective Plant Boards. The members of the regional boards cooperate very closely and have annual meetings at which time the inspection and plant quarantine requirements of each region are discussed. In order to have closer cooperation between the regional boards a national plant board was organized. The National Plant Board consists of 2 members from each region, elected by the members of the respective regional boards. The National Plant Board in turn cooperates very closely with the Federal Bureau of Entomology and Plant Quarantine, thereby creating a close interrelationship in the inspection and plant quarantine work in the entire United States.

As previously mentioned one of the important aspects of Entomology is insect control. Insect control consists of two



Life history of the spiny elm caterpillar

major phases, namely applied control and natural control. Applied control is concerned with the application of measures by man, the efficacy of which are definitely influenced by the operators. Natural control on the other hand is not influenced by man to any extent and its success is dependent upon natural factors. Applied control may be divided into, first, chemical control or the application of insecticides and repellents; second, physical or mechanical control; third, cultural control or the use of farm practices; fourth, biological control or the artificial use of parasites and predators; and fifth, legal control or inspection and quarantine laws. Natural control on the other hand may be classified as, first, climatic factors; second, topographic features; third, predators and parasites; and fourth, insect diseases.

The phase with which plant pest regulatory officials are primarily concerned is legal control. This includes measures prohibiting the importation of certain plant materials from foreign countries and provides for the importation of such plants and plant products, under Federal permit, which are not considered pest risks. It also provides for the inspection of approved plant importations, thereby reducing the possibility of pest introductions to a minimum. All shipments are carefully scrutinized for plant diseases as well as for insect pests. The several States cooperate very closely with the Federal Department in this matter. The interstate movement of plant material is governed by rules and regulations promulgated by the several States and the shipping of nursery stock anywhere in the United States is illegal unless the shipment has been State inspected and certified.

Quite frequently when established pests build up a population in destructive numbers compulsory clean-up measures are applied. Cultural practices or the appli-

cation of insecticides and fungicides are carried on under the supervision of qualified regulatory men. When a newly introduced pest which promises to be a potential menace becomes established in certain areas within the States, steps are taken by the State regulatory officials, as well as by the Federal Department, to overcome them. When such action is necessary, the infested areas are quarantined and restrictive measures are applied to prevent the spread of the organism.

Insecticide laws have also been promulgated by the United States Department of Agriculture and some States, standardizing the grades of insecticides and fungicides. All regulations are designed to protect the public.

The effectiveness of insect control is dependent to a great extent upon the support it receives from the public. In order to obtain that support it is necessary to carry on an extensive educational program. One important feature of this program deals with exhibits. A detailed study was made by the writer of the various types of exhibit material that might be used for an effective educational purpose. It was soon discovered that those which attracted and held the attention of the public were simple life history mounts of our insect pests, such as the one shown in the figure. In these mounts the various stages of the insect are shown in the regular sequence of their appearance in nature. Simple footnotes explaining the various stages and their time of appearance add to their efficacy. Since no mounts to meet our particular needs were available they were constructed by our own entomologists. Special emphasis was placed on the fact that they be scientifically correct in every detail and still were simple enough to carry their message to the layman. The response to these was instantaneous and much more satisfactory than had been anticipated. It is interesting to watch adults, as well as students of high school age, pore over these mounts and study the simple revelation of insect life. Combinations of life cycles in the same mount are avoided in order to escape complexity of the exhibit materials.

It is astonishing to note the lack of knowledge of otherwise well informed persons regarding the simple fundamental phases of insect metamorphosis. Can the biology teachers help alleviate this condition? We recognize that biology teachers must necessarily cover a large field of science and we must not overlook the fact that a single phase of insect control is only a minor part of their curriculum. However, biology teachers like plant regulatory men are public servants and their close cooperation should prove mutually beneficial.

NEW ASSOCIATE EDITORS ELECTED

The editorial staff of THE AMERICAN BIOLOGY TEACHER has been strengthened recently by the election of four additional associate editors:

Dr. F. Martin Brown, Cheyenne Mountain Museum, Colorado Springs, Colorado.

Brother H. Charles, Saint Mary's College, Winona, Minnesota.

Mr. Philip Goldstein, Walton High School, The Bronx, New York City.

Mr. Alan A. Nathans, Christopher Columbus High School, New York City.

An Experience with the Problem Method

HOWARD H. ROSTORFER
Knoxville, Tennessee[1]

The ideal of the problem method in teaching is to give the student greater opportunity to gather first-hand information by his own observations, but, in so far as possible, without decreasing the rate of useful learning.

With this in mind a program of instruction was set up in the science department of Christenberry Junior High School in Knoxville, Tennessee. Christenberry is a modern school where discipline is maintained but is never obvious. Much of the program is integrated. For example, there is correlation between science, fine arts and shopwork. The student body is varied. The library facilities are above the average and the building is modern and of superior construction. All programs of the science department were carefully explained to the students in order that they would understand the aims sought and the difficulties to be overcome. The enthusiastic approval of a project by the students was an important step toward the final success of the program. The students cooperated to better advantage, felt that the class was their own and that they were responsible for its success. Each child so desiring could purchase a text-book, but the school owned three sets of different text-books for each classroom. The students were allowed to take these books out over night. During three years only two books were lost. There was never a selection of a definite text for the biology class.

Sufficient space is not permitted to describe fully the science program, but six types of activities which were successfully used are described below.

Discussion Periods

One class period of each week was given over to general discussion. It was found to be advantageous to use only one period each week in this way. The students were prepared and the discussion carried out in the following manner. A chairman was appointed for each class who was responsible for directing the discussion, keeping the comments relevant to the topic. Usually three short reports were assigned to expedite the program. Voluntary reports were accepted but the time allotted was limited. The teacher kept anecdoted records of the work of each individual recording the number of times the student spoke, the relative importance of what was said, mistakes in English, failure to comply with the rules of discussion, etc. The students were encouraged to check their own mistakes as well as those of others. At no time was a student interrupted for the purpose of correction. A time was set aside for corrections at the end of each discussion period. The students had five or six days to prepare for these discussions.

Some interesting results were obtained. From eighty to one hundred and thirty different comments, questions, and answers were recorded for classes of thirty-

[1] The author wishes to express his appreciation to Mr. Wilson New, principal of Christenberry Junior High School, Knoxville, Tennessee, under whose direction this work was carried out.

five students in a forty-five minute period. Students spoke from one to eighteen times. They raised questions and settled them. They brought in many facts and ideas that would never have been mentioned otherwise. They learned to think and speak on their feet and to follow an orderly procedure. They increased their library work tenfold. They looked forward to the discussion periods; if one were missed, they inquired when the next one would be held. Practically all the students took part, the number not responding diminished as the term progressed. Some pupils seemed to have a natural bent for talking that did not always correlate with their intelligence. The success of this method varied somewhat with the topics. There were never more than two students in a class who failed to respond. The type of part taken by different students was often influenced by a number of things such as, personal appearance, clothes, home training and intelligence.

Use of the Library

The library contained about three thousand volumes of new, attractive books, and it was desirable to make better use of them. Each student was given a mimeographed copy of the title, author and call number of the books pertaining to each subject as it was taken up in class. The teacher commented on each book as to value and interest of the material it contained. The students were given extra grades for reading books on these lists and were encouraged to read two books on each subject. Book reports were prepared, and, when time permitted, were given before the class. Under this method books were read that had never been taken from the shelves before, and the library was able to get an accurate check on the usefulness of the different books.

A Weather Bureau

Each semester a weather bureau was established and maintained by the students. A staff was appointed for the duration of two weeks, consisting of a chief, an assistant, a wind observer, a barometer observer, a maximum and minimum thermometer recorder, a cloud observer, a distribution manager, a mimeographer, and a student responsible for the cartoon called "Chris Junior." Each semester a number of mimeographed copies of a blank map of the United States and the cartoon were prepared. The daily report was superimposed on the blank. This required one stencil per day. A copy of the daily report was distributed to each of the classrooms. The chief called the local (official) weather bureau each morning at eleven o'clock and obtained information on the high and low pressure areas and the precipitation for the United States. This information was placed on the daily map along with the readings of the various instruments and predictions. A twenty-five cent balloon was sent up each week. This permitted some observations on the upper air currents and visibility. During the course of the semester each student had a position on the weather bureau. The positions were allotted according to ability and preference of the student.

The students learned to be responsible for a small part of a continuous program. They learned to use the telephone and to record accurately the report of the local weather bureau. They were responsible for the training of the next group of students who were appointed to take over their duties. Once the program was established the teacher was not needed except in emergencies. Of course some groups were better than others, but no group was a failure. Because of the activity in the weather

bureau much interest was aroused in the relationship of biology and weather. The effect of climate on health and the distribution of plants and animals with reference to climatic zones were topics of interest and much discussion in the general classwork. The proximity of the Great Smoky Mountains was an important factor in this study. Nearly all students had observed the distribution of trees in relation to the altitude.

Establishing a Museum

The students were interested in maintaining a museum. The materials were brought in by the students, and the preparations were made during their recreation periods, study periods, and after school. Students who were interested in taxidermy brought their own animals, and the school furnished instruction and mounting materials. Some became experienced enough so that they were able to train others. Preliminary training was obtained with the English Sparrow. Later on when the project became more generally known the whole school contributed materials. The students were allowed to keep their work, but many of them preferred to give it to the school. Some of the birds were placed in a permanent mount with a translucent scene of a mountain view as a background and an artificial foreground, this being lighted from behind the translucent scene.

Because of the interest in the Great Smokies and the great variety of trees there, the students took considerable interest in different kinds of wood, the habitats of the trees and their abundance and value. They made collections of various woods accumulating sixty different kinds; each specimen showed the grain, the bark and a cross section. These were mounted on ply-wood plaques along with a leaf print of the same tree, the botanical description and a map showing the general distribution. The mounts were prepared by the boys in the class who were taking "shop" and the girls taking art. Insect collections were made in the fall of the year and wild-flower collections in the spring. Some students who needed extra credit made charts which were useful as teaching aids.

Landscaping

A landscaping group was organized of boys who did not do well in the class. These boys were taught to care for the trees and shrubs. They had charge of the school grounds, planted trees, pruned them and built up the soil so that it would support their growth. On Saturdays and holidays they made trips to the mountains to secure trees and shrubs for transplanting and to learn to identify the flora. In two years about three hundred trees and shrubs were planted on the school grounds, two hundred of which survived. The boys also kept the grounds clean, maintained paths and laid out the playground areas. Some of the boys who went to the mountains had never been in a forest before, and took great interest in this work. They took a new interest in school, also, and came to school regularly after these programs were started. Before this work was begun the school grounds were bare and mostly a red subsoil which would not even grow Bermuda grass. There were about seven acres, all of which had to be fertilized, limed and tilled. The fertilizer was leaves brought in by city trucks. Some of the mountain trees required acid soil, which was secured by treatment with Epsom salts.

Auditorium Programs

The different departments of the school were responsible for an auditorium pro-

gram each semester. Each class was divided alphabetically into three groups and each group selected a chairman who appointed a committee. These committees produced a dramatization or pageant of some scientific discovery or event, debated, or performed some demonstration for the benefit of the class. These separate programs were given before the class and the best ones were selected to be given before the entire school. The programs were rehearsed by the auditorium teacher and brought to some degree of perfection. Materials were obtained by students from the library, from other teachers, from members of the park service or T.V.A. The students enjoyed these activities. Most of the work was done after school hours. Twenty minutes of the class period were given over to the preparation of the programs during the last three days before they were to be presented.

There were many other projects and activities which were equally interesting. It should be stated that the general subject matter was well covered during the term. No phase of the work was neglected but all was on the level of understanding of the student. They dealt with the terms, ideas and thoughts in their own manner. They took greater interest than any class taught by the writer in the more formal manner. There was no complaining about the amount of work required because it was interesting to fulfill these requirements. On several occasions students who were held over for a term because of failure in some other course took biology again without credit.

Both the problem method and the method of "teacher do all" have been used by the writer, who, believing that the latter method is responsible for the disheartened and dissatisfied attitude of so many teachers, suggests that they try the former.

Bringing Marine Animals to an Inland Laboratory

PHILIP H. POPE
Whitman College, Walla Walla, Wash.

Those who teach biology in seaside towns or cities, or within easy striking distance of the beach, have undoubtedly conducted their classes to the ocean for the purpose of studying marine life at first hand. Those who live far inland seldom have this pleasure. The disadvantages of always using preserved material are obvious. The following account tells how living marine plants and animals may be brought back to an inland school located up to 500 miles from the coast, and how they may be exhibited for several days.

Last year we made a very successful collecting trip during the last half of the Easter vacation, bringing back over 100 living sea animals representing five phyla and eighteen classes. This was our third trip; it was made in two cars carrying eight people, three of them major students who were glad to go both for pleasure and experience.

Those planning such a trip should in-

quire of course about the tides, the minus tides at new and full moon being particularly advantageous because they make it possible to find certain forms that are usually submerged. A minus tide also gives additional time for collecting and it is well to know that low tides will come at a convenient time of day. Data about the tides are usually published in coast newspapers.

Do not plan on visiting the nearest stretch of beach. This may be too near some town to find sea life in abundance and it may be unsatisfactory on account of large amounts of fresh water draining into the area. If your state has a seaside experiment station, both time and trouble may be saved by asking the cooperation of the officials there. Here on Puget Sound we have the oceanographic station of the University of Washington at Friday Harbor. The vicinity of such a station is always a good collecting ground. The party can patronize the nearest cabin camp. A stay of two days and three nights gave us plenty of time. If pressed for time we could do it all in one day but since an enjoyable vacation is part of the plan, we take two.

Our first collecting trip was planned for low tide on the mud flats, as animals that live in the mud stand life in a jar better than those that live in the surf among the rocks. Sand craters, with little coiled casts at the top, show the presence of lug worms; and larger ones opening into half-inch holes reveal the homes of the ghost shrimps, Upogebia and Callianassa. It takes hard digging in the sticky mud to get these last but the by-products are interesting, for Nereis and smaller annelids, ribbon worms (Nemertinea), and clams frequently come up on the shovel. Tide pools yield crabs, "feather duster worms" with bright crimson tentacles, copepods, little fish and tiny larval crustaceans, while any rotten log may be split open for "ship worms" (Teredo). Old pilings are worth examining too for such forms as isopods.

Digging for crustacea on the mud flats at False Bay.

The return of the tide drives us back to our cars with full buckets. At the cabins the first task is to sort out specimens and put them in separate jars, each with plenty of freshly dipped sea water. Separation of animals and frequent changes of water are essential if marine animals are to be kept alive for any length of time either in transport or on display. For the same reason good sized receptacles are necessary and the collector should remember that a small starfish or sea urchin is likely to live longer than a big one.

The second day's collecting is always more interesting than the first, for we visit rocky points where the waves have carved out small caves with sandy coves between them. Barnacles cover the rocks between tide marks and bare patches here and there show where starfish have eaten them off. Limpets of two species, snails of many types, and several kinds of curious jointed chitons (Amphineura) are common, while goose-neck barnacles cluster in many of the crevices. As on all rocky shores the tide pools are beauty

spots. Here are found tunicates, hydroids, sea anemones, mussels, starfish of several species, some of them purple or red, brittle stars, sea cucumbers, sponges, and the ever-present crabs, with a varied assortment of red and brown algae. In 1938 we were lucky enough to find comb jellies (Ctenophora) and hydro-medusae (Gonionemus) floating in the harbor in large numbers. From the wharves we collected and fixed over 100 of each besides those taken home alive.

Sea plants have hardly been mentioned, but there is quite an assortment of small red and brown forms in the rock pools and clinging to the piling of wharves. The rocks are not coated with Fucus as they are on the Atlantic Coast, but some of the kelps, like Nereocystis, are common and large. Every year we select a big one, roll it up in a sack and take it home to string along the posts in our laboratory, where its forty feet of rope-like thallus and ten feet of leaves hanging from that, make a striking exhibit.

The day of the return is always a long one, for the ferry starts at six. This means we must be up at four to change the water on all our animals and pack them into the cars for the long trip. With heavily loaded cars we have never covered the distance in less than ten hours, and at the end of it the unpacking and water changing extend the time. A good light truck, if available, would best accommodate a large expedition—a delivery truck would be just the thing. In an uncovered truck, a tarpaulin is necessary to shade the load. If the weather is hot, a supply of ice would keep the water cool and prevent loss of oxygen.

The next two days are always given up to exhibiting and demonstrating our specimens to all the classes in the department. To see a starfish or sea urchin crawling with its tube feet or a sea anemone swallowing a bit of mussel meat is something quite new to most of the students, even if they live near the sea. There will inevitably be a few who glance about superficially and are bored at the idea of taking notes, but there are enough who appreciate it to make us feel that it is a very valuable supplement to the routine of our teaching. Townspeople may be invited to an evening session if desired.

To consider ways and means: our equipment consists of spades, trowels, putty knives, forceps and a vasculum. For containers we take a small galvanized tub, several buckets, a small thermal jug, many vials and about four dozen jars of various sizes, which have never contained formalin. These are packed in fiber boxes for safe carriage. A kodak is necessary if lantern slides are to be made later. This year I took my Cine-Kodak, loaded with Kodachrome film, and made a start on what I hope will prove to be an interesting color film of collecting operations and particularly of sea life in its natural colors. At first we made the trips at our own expense but last year we were partially reimbursed for gasoline by the school.

We have not yet fully solved the problem of getting enough fresh sea water to keep our animals alive for any great length of time. Even with windows open to keep them cool and with much pouring of water for aeration most of our specimens die within 48 hours. This year we plan to take a couple of 5 gallon tins besides several one gallon glass milk jars. Sea water could be shipped from the seashore a day or so afterwards but this would add to the expense. Small air pumps for aerating aquaria are on the market and I have seen plans for an hydraulic apparatus to attach to the faucet and bubble air through the aquarium.

For the benefit of those who live too far inland to drive to the seashore one of the large supply houses will send sea water and living marine animals anywhere in the country at a minimum cost of $5.00 for a small collection, with additional specimens for $0.90 each. The cost of a large exhibit would be high, but a few selected species could probably be kept alive for some time and varied by the occasional purchase of something different.

Education by an Extra-curricular Activity

W. WREN SHOUGH
Dover High School, Dover, Ohio

Remember the cold winter mornings when we were kids? We used to tear down stairs and dress in front of the stove, then clatter out to the kitchen for breakfeast. Almost always in the winter time we would have pancakes and many were the times, in our anxiety to get started on our stack, that we would eat the first two or three without syrup or butter. Later, after we settled down, we would begin eating in the sober and orthodox manner, first buttering the pancakes with a lavish hand and then gloriously spreading a stream of golden syrup over the whole plate of cakes.

Let us consider those first two or three unadorned pancakes. We ate them, it is true, in the nude, without the customary embellishment of butter and syrup and found them good but it was the eagerness of a boyhood appetite that supplied the sauce. How dull it would have been never to have had the butter and syrup on the cakes that followed. The thrill of pancakes was in the accessories. Cakes alone were not enough.

In the modern school, the classroom and its work are not to be considered as the whole and final effort of the teacher. There must be some syrup on the pancake. Although this statement may be self-evident, the method and means of curriculum enrichment must remain an enrichment and must not be allowed to become an end in itself. Projects sometimes get out of hand, so much time being spent on the actual mechanics of the project that the lesson that is to be taught is overlooked and forgotten. Clubs become mere social organizations in which a good time is had by all, but the learning of subject matter is ignored. Much of the criticism, the leveling of which has become quite stylish recently, is directed at methods which have become ends rather than means. We must keep in mind that although pancakes without syrup are poor fare, syrup without pancakes is absurd.

It is an unfortunate choice of words to describe certain school activities as extra-curricular, since in many cases it is in those activities that the objectives of the curriculum are realized. It is a biased critic indeed, who labels a method "soft pedagogey" because the work done is interesting to the student. In teaching biology, the availability of activities for enriching and amplifying the work of the classroom is unlimited. Projects exist by the dozens in every back

yard. Hikes, field trips, collecting tours, etc. are the very essentials of the course of study. Clubs of many kinds find their basis in the study of biology. It is almost impossible to visualize a course in biology that does not include at least a few of these features.

To illustrate the point of curriculum enrichment without "softness" and to show other benefits accruing from such activities, let us take an actual case. As an outgrowth of the biology classes of Dover High School, a taxidermy club was formed three years ago. The club arose as a result of popular demand on the part of the students and has since existed as a student owned and operated project, the faculty advisor acting strictly in an advisory capacity suggesting and encouraging rather than demanding. Here is one of the less obvious values of an extra-curricular activity, the benefit given the club members in solving the problems arising in the development of a smooth-running organization. Experience has shown that although some guidance and encouragement is necessary on the part of the advisor, the members are very capable of handling the mechanics of running the club, in many cases setting up and solving more difficult problems than are handled in the typical classroom.

A problem arising early in this history of the club was the collection of specimens. The boys decided, of course, not to kill any specimens for taxidermy purposes. Besides being, in most cases, illegal, such a course of action is in direct opposition to the principles of conservation which are of great importance in forming a background to the work of any biology club. An advertising campaign outlining the work of the club to the school and the public, coupled with an offer to mount one of a pair of specimens free for the donor, solved the problem. Birds and animals killed by accidents or found dead are now brought to the club. So many specimens come in, that the club is sometimes temporarily embarrassed by riches.

A single social gesture undertaken by the group was the sponsoring of a school dance. The proceeds from this dance were used to purchase a Rhesus monkey. This monkey, mounted by the club members, forms a chief exhibit in the school museum. It is well to note that the function of this dance was to provide the money necessary to purchase the monkey, not merely to hold a dance. Also of interest is the fact that the club now builds up its treasury by fees earned from mounting specimens rather than by sponsoring dances. It is evident that this indicates an advance in club management.

Members of the Taxidermy Club learn biology, particularly anatomy and ecology. To mount a bird or animal in a satisfactory manner a complete knowledge of the anatomy must be had. To place the specimen in a habitat group, as the more advanced members are doing, ecology plays a leading part. It is unreasonable to believe that pupils taught anatomy or ecology in the classroom, strictly as a school subject could ever reach the understanding gained by club members in mounting a series of specimens. We learn best by combining action with study.

The school has benefited to a great extent from the efforts of the group. Although the club membership is small, being limited to twenty boys, the group mounts from forty to sixty specimens each year. About a third of these are presented by the club to the school museum. The museum receives each year a group of mounted birds and animals which, if bought from the supply houses

would be valued at an amount that would prohibit their purchase. The use of mounted specimens as a teaching device needs no recommendation to those who have used it. In birds, especially, mounted specimens are invaluable in showing adaptation of structure to function. Our biology classes have gained much in interest and in knowledge from the efforts of the taxidermy club.

Doubtless, the greatest benefit of the club is to the individual members. They learn patience and a never ending attention to detail that is rare in this age of slap-dash, high-speed, production. Taxidermy is a creative art and mounting a bird in a living pose is not an easy task. Although the rudiments can be mastered in two or three lessons, long practice and a supreme effort is necessary to overcome the obstacles in the path between a stuffed bird that looks "stuffed" and the final climax of showing the specimen as it was in life. It is good to know that our young people can maintain this high standard of craftsmanship. To undertake and master a difficult task is a great lesson learned by a chosen few. A club can teach this lesson all the better since the task is self-set.

Let us keep the syrup on the pancakes, lest the pancakes, good though they are without extras, lose their thrill and value for us.

Close to Nature: Biological Field Stations

HOMER A. JACK
Science Education Department, Cornell University

(*Continued from March*)

Iowa

12. The American Institute of Nature Study. McGregor. Two-week session, beginning about the first of August. Course offered in nature-study. Tuition: $5. Glenn W. McMichael, McGregor.

13. Iowa Lakeside Laboratory. West Okoboji Lake, Milford. Two five-week sessions, the first beginning about the third week in June. Courses offered in field biology and protozoology. Total costs: $67. Prof. Joseph H. Bodine, State University of Iowa, Iowa City.

Louisiana

14. Louisiana State University Feld Laboratory. Grand Isle. Eight-week session, beginning about the first week in June. Course offered in marine zoology. Total costs: $65. Prof. E. H. Behre, Louisiana State University, University.

Maine

15. University of Maine Marine Laboratory. Lamoine. Six-week session, beginning about the first week in July. Course offered in marine invertebrate zoology. Total costs: $126. Prof. Joseph M. Murray, University of Maine, Orono.

16. Audubon Nature Camp. Damariscotta. Five two-week sessions, beginning about the middle of June. Courses offered in the general fields of ornithology, botany, entomology, marine and fresh-water life, and nature activities. Total costs: $51. Carl W. Buchheister, National Association of Audubon Societies, 1006 Fifth Avenue, New York City.

17. Mount Desert Island Biological Laboratory. Salsbury Cove, Mount Desert Island. Six-week session, beginning about the second week in July. Course offered in invertebrate zoology. Total costs: $126. Prof. William H. Cole, Rutgers University, New Brunswick, New Jersey.

Maryland

18. Chesapeake Biological Laboratory. Solomon's Island. Six-week session, beginning about the last week in June. Courses offered in algae, diatoms, invertebrates, economic zoology, invertebrate embryology, protozoology, and ichthyology. No tuition. Prof. R. V. Truitt, University of Maryland, College Park.

Massachusetts

19. Nature Guide School. Pine Tree Camp, Plymouth. One six-week session, beginning about the first week of July and one two-week pre-camp course. Courses, given in a four-year rotating plan, offered in insects, invertebrates, physiography, scouting methods, flowering plants, gardening, geology, camp leadership methods, trees and forestry, non-flowering plants, vertebrates, birds, ponds and streams, and ecology. Total costs: $69 (for the six-week session). Prof. William G. Vinal, Massachusetts State College, Amherst.

20. Marine Biological Laboratory. Woods Hole. Two six-week sessions, the first beginning about the third week in June. Courses offered in invertebrate zoology, protozoology, embryology, physiology, and morphology and taxonomy of algae. Total costs: $129. Prof. Charles Packard, Institute of Cancer Research, New York City.

Michigan

21. Michigan State College School of Field Biology. W. K. Kellogg Wild Life Sanctuary, Augusta. Six-week session, beginning about the third week in June. Courses offered in woody vegetation, aquatic plants, entomology, aquatic insects, ornithology, economic zoology, and field zoology methods. Total costs: $65. Prof. Joseph W. Stack, Michigan State College, East Lansing.

22. Biological Station of the University of Michigan. Douglas Lake, Cheboygan County. Eight-week session, beginning about the fourth week of June. Courses offered in taxonomy of fresh-water algae, taxonomy of bryophytes, systematic botany, plant anatomy, advanced systematic botany, plant ecology, aquatic flowering plants, plant tissue culture and morphogenesis, entomology, ornithology, advanced ornithology, ichthyology, natural history of invertebrates, herpetology and mammalogy, limnology, helminthology, and limnological methods. Total costs: $106. Prof. Alfred H. Stockard, University of Michigan, Ann Arbor.

Minnesota

23. Lake Itasca Forestry and Biological Station. Douglas Lodge, Itasca State Park. Five-week session, beginning about the last week in July. Courses offered in elements of field taxonomy, field botany, elementary field ecology, bryophytes and pteridophytes, advanced taxonomy of flowering plants, field research methods in ecology, field dendrology, field mycology, field entomology, wild life conservation, natural history of the higher vertebrates, techniques of field biology, parasitology, natural history of invertebrates and fishes, protozoology, advanced protozoology, limnology, and helminthology. Total costs: $64.80. Prof. Alexander A. Granovsky, University of Minnesota, University Farm, St. Paul.

Mississippi

24. Mississippi Delta State Teachers College Field Trip. Biloxi. Two-week course, beginning about the middle of August. Course offered in field botany. Total costs: $32.50. Prof. R. L. Caylor, Mississippi Delta State Teachers College, Cleveland.

New Hampshire

25. Merriconn Biological Laboratory. Nelson. One six-week course in comparative anatomy and field zoology, beginning about the middle of July, and a two-week training course for teachers and nature leaders, beginning any time between the middle of June and the middle of September. Total costs: $90 (for the six-week session). Prof. Parke H. Struthers, Syracuse University, Syracuse, New York.

26. New Hampshire Nature Camp. Lost River Reservation, North Woodstock. Two two-week sessions, the first beginning about the third week in June. Course offered in nature study. Total costs: $50. Dr. Jarvis B. Hadley, Tufts College, Medford, Massachusetts.

27. Isles of Shoals Marine Zoological Laboratory. Isles of Shoals, Portsmouth. Eight-week session, beginning about the third week in June. Courses offered in comparative anatomy of the vertebrates, invertebrate zoology, histology-embryology, laboratory technique, and the teaching of biology in secondary schools. Total costs: $148.25. Prof. L. C. Fogg, University of New Hampshire, Durham.

New Mexico

28. Biology Field Courses of Texas Technological College. Las Vegas. Six-week session, beginning about the first week in June. Course offered in general biology. Total costs: $91.50. Dr. R. A. Studhalter, Texas Technological College, Lubbock, Texas.

New York

29. Biological Laboratory of the Long Island Biological Association. Cold Spring Harbor, Long Island. Two six-week sessions, the first beginning about the third week in June. Courses offered in experimental surgery, experimental endocrinology, and marine and fresh-water zoology. Total costs: $138. Eric Ponder, Biological Laboratory, Cold Spring Harbor, Long Island.

30. Allegany School of Natural History. Allegany State Park, Quaker Bridge. Six-week session, beginning about the first week in July. Courses offered in field botany, field zoology, natural history of birds, wild life conservation, and field methods in nature study. Total costs: $150. Prof. Robert B. Gordon, State Teachers College, West Chester, Pennsylvania.

North Carolina

31. Duke University Marine Station. Piver's Island, Beaufort. Two six-week sessions, the first beginning about the second week in June. Courses offered in algae, marine zoology, plant ecology, parasitology, and invertebrate zoology. Total costs: $82. Prof. A. S. Pearse, Duke University, Durham.

Ohio

32. Franz Theodore Stone Laboratory. Put-in-Bay. Six-week course, beginning about the third week in June. Courses offered in fresh-water algae, plant taxonomy, plant ecology, physiological methods as applied to aquatic plants, higher aquatic plants, advanced entomology, aquatic entomology, climatology, invertebrate zoology, advanced invertebrates, aquiculture, ichthyology, animal parasitology, limnology, advanced limnology, field biology, advanced ornithology, herpetology, comparative physiology, and physiology of fishes. Total costs: $64. Prof. Thomas H. Langlois, Stone Laboratory, Put-in-Bay.

Oregon

33. Oregon Institute of Marine Biology. Coos Head. Six-week session, beginning about the second week in June. Courses offered in field zoology, biology of fishes, embryology of marine invertebrates, invertebrate zoology, taxonomy and ecology of marine algae, morphology of marine algae, systematic botany, paleobiology, and biological science survey. Total costs: $78. Prof. Earl L. Packard, Oregon State System of Education, Corvallis.

Pennsylvania

34. University of Pittsburgh Lake Laboratory. Presque Isle Peninsula, Erie County. Eight-week session, beginning about the fourth week in June. Courses offered in field botany, nature-study, field zoology, and entomology. Tuition: $35. Prof. O. E. Jennings, University of Pittsburgh, Pittsburgh.

35. Pennsylvania State College Nature Camp. Stone Valley, Huntingdon County. Two three-week sessions, the first beginning about the last week in June. Courses offered in nature education for elementary school teachers and for high school teachers. Total costs: $75. Prof. George R. Green, Pennsylvania State College, State College.

South Dakota

36. South Dakota State College Botany Summer Camp. Nemo. Six-week session, beginning about the second week in June. Course offered in the taxonomy of the Black Hills flora. Total costs: $40. Prof. Leon C. Snyder, South Dakota State College, Brookings.

37. Lake Enemy Swim Biological Station.

Waubay. Four-week course, beginning about the third week in July. Courses offered in animal biology, plant biology, entomology, genetics, and taxonomy of flowering plants. Total costs: $45. Prof. S. R. Lipscomb, Northern State Teacher's College, Aberdeen.

Virginia

38. Mountain Lake Biological Station. Mountain Lake, Giles County. Two five-week sessions, the first beginning about the third week in June. Courses offered in morphology of seed plants, taxonomy, algae, fungi, protozoology, cell morphology, experimental morphology of amphibians, and hydrobiology. Total costs: $90. Prof. Ivey F. Lewis, University of Virginia, University.

Washington

39. Walla Walla College Field Nature School. An itinerant school, with headquarters at College Place. Three-week session, every odd year, beginning about the second week in July. Course offered to give students and teachers a working knowledge of nature from first-hand observation. Total costs: $42.50. Prof. Harold W. Clark, Pacific Union College, Angwin, California.

40. University of Washington Oceanographic Laboratories. Friday Harbor. Nine-week session, beginning about the third week in June. Courses offered in physiology of bacteria, marine plants, physiology of marine plants, phytoplankton, oceanographic chemistry, physical oceanography, biochemistry of marine life, oceanographic meteorology, advanced invertebrate embryology, and advanced invertebrate zoology. Total costs: $89.25. Prof. Thomas G. Thompson, University of Washington, Seattle.

West Virginia

41. West Virginia University Biological Expedition. An itinerant station, with headquarters at Morgantown. Six-week course, beginning about the third week in June. Courses offered in field botany and field zoology. Total costs: $85. Prof. P. D. Strausbaugh, West Virginia University, Morgantown.

42. Nature Leaders Training School. Oglebay Park and Lake Terra Alta. Two two-week sessions, the first beginning about the second week in June. Courses offered in birds, reptiles and amphibians, fresh-water life, mammalogy, insect life, plants, geology, and astronomy. Total costs: $29. A. B. Brooks, Oglebay Institute, Wheeling.

Wisconsin

43. Geneva Lake Summer School of Natural Science. Williams Bay. Six-week session, beginning about the last week in June. Course offered so teachers and others may develop first-hand contacts with the out-of-doors. Tuition: $25. O. D. Frank, 5835 Kimbark Avenue, Chicago, Illinois.

Wyoming

44. University of Wyoming Science Summer Camp. Centennial. Five-week session, beginning about the third week in June. Courses offered in taxonomy of vascular plants, ecology, fresh-water algae, field and laboratory course in general botany, elementary field course in geology, five-week advanced field course in geology, elementary field and laboratory zoology, aquatic zoology, and five-week elementary course in botany, geology, and zoology. Total costs: $93.50. Prof. S. H. Knight, University of Wyoming, Laramie.

Biological Briefs

RUTH SHERMAN

STABLER, ROBERT M. *Frequency of Skin Shedding in Snakes.* Copeia 1939 (4): 227–229. December, 1939.

The author has kept moulting records of 21 snakes living in captivity for a year or longer. They were maintained in unheated quarters, so that during the colder winter months they went into hibernation. The average number of months elapsed between each shedding was 3.2; discounting the winter rest, however, the elapsed time between each moult during the active season was 1.5 months. There was no observable difference in number of moults between the species studied. The frequency is probably affected by temperature, while food does not seem to be an important factor.

PRIOR, SOPHIA. *Mistletoe and Holly.* Field Museum of Natural History Botany Leaflet 24.

Here is another in the series of excellent botany leaflets published by the Field Museum of Chicago. For each type of plant, a brief description of distribution, species, life history, and associated traditions is included. Among the points of interest concerning mistletoe is the fact that there are 200 species in the western hemisphere, among which the tropical varieties are notable for the size and beauty of their flowers and fruit. Besides English holly and American holly, another well-known member of the genus *Ilex* is Paraguay tea, yielding the drink *yerba maté*. The leaflet is well illustrated by line drawings.

FRISBIE, W. S. *Public Health Aspects of the Federal Food, Drug, and Cosmetic Act.* American Journal of Public Health 29: 1292–1296. December, 1939.

The Federal Food, Drug, and Cosmetic Act of 1938 has definite value in preventive medicine. A food is classed as adulterated if it contains any substance injurious to health. Where foods must contain some toxic material for pest control or preservation, a limit of tolerance is fixed. The conditions under which food is prepared are also controlled. Foods for medicinal value and those containing a large vitamin supply must be so labeled. Only harmless certified coal-tar colors may be used, and any artificial colors, flavors, and preservatives must be declared on the label. Drugs are much more strictly controlled than heretofore. The act contains strict provisions regarding the production and sale of new drugs (a direct result of the "Elixir of Sulfanilamide" tragedies). Medicines containing dangerous drugs are misbranded if they are found to be injurious to health when taken in the dosages given on the label. Habit-forming drugs must be so labeled. Where a medicine contains more than one active ingredient, each must appear on the label. Cosmetics containing substances dangerous to health, such as certain coal-tar dyes when used near the eyes, are likewise prohibited from interstate commerce.

SMITH, WYMAN. *The Largest Community Forest.* American Forests 46: 22–25. January, 1940.

When in 1900 the city of Seattle acquired control of the Cedar River watershed in order to maintain unimpaired the source of its water supply, it had not been foreseen that through wise forest management the property would pay for itself and yield an annual profit. It now contains 66,300 acres, the largest community forest in the United States and possibly the largest in the world. Cut-

over lands are now covered with second growth, and lumbering is carefully controlled so as to perpetuate the supply of mature, sound trees covering a wide watershed area.

SAPPINGTON, S. W., AND GRANT O. FAVORITE. *Sulfanilamide and Meningitis.* Annals of Internal Medicine 13: 576–597. October, 1939.

It is interesting to follow the progress of medical research with the newly-famous drug sulfanilamide, for the discovery of which Dr. Gerhard Domagk has been awarded a Nobel prize for 1939. This article reports considerable success in the sulfanilamide treatment of several types of meningitis streptococcus. Of 227 cases so treated, the mortality was reduced from an expected 95% to one of 20%. Some work was also done in adding the drug to meningitis serum, but the results were not definitely more satisfactory than in the use of sulfanilamide alone. In discussing this drug with classes, it is vitally important to stress the great danger involved in its administration except under expert medical supervision.

JAEGER, ELLSWORTH. *How to Know Footprints.* Natural History 44: 226–232. November, 1939.

Here is a welcome contribution to the lore of the out-of-doors which may be utilized particularly well during the snowy winter months. The author presents a well-illustrated key to the footprints of many of the more common wild mammals, grouped according to the position of the foot while walking.

TRUMP, RICHARD F. *Where Do You Get Your Brains?* Hygeia 17: 993–995, 1053–1054. November, 1939.

The Jukes, Kallikaks, and Edwards are no longer considered to be valid examples of the inheritance of mental abilities and defects. Research is showing that "native" intelligence may be greatly affected by the environment. Studies of identical twins reared separately show that fortunate circumstances do raise the level of intelligence.

BABCOCK, E. B. *Recent Progress in Plant Breeding.* Scientific Monthly 49: 393–400. November, 1939.

Tobacco and corn were the first crops to be improved by selecting and standardizing hybrids for vigor and increased yield. The methods thus developed are now being profitably applied to many other plants. Hybridized black walnut trees are faster-growing and disease-resistant. In resistance to fungus, nematodes, and insects, improvements have been made in many vegetables. By combining the flavor of the watermelon with the wilt-resisting qualities of the field melon, a sturdy fruit has been obtained. Wheat which withstands black stem rust and disease-resistant tobacco are now obtainable.

Several methods are now being used to speed up plant growth, both for early yield and to synchronize the blooming period of two or more varieties for the purpose of hybridization. These include: (1) developing plants with multiple sets of chromosomes; (2) artificially controlling the length of illumination periods; (3) vernalization (pretreating the seed); (4) keeping plants or flowering branches in nutrient solutions. Pretreating embryos with nutrients has long been applied to orchids. Now rose, peach, and apricot embryos removed from the seed and geminated in nutrient agar result in increased growth rate and greater yield. Vitamin B_1 also increases the percentage of germination. The author emphasizes the rapidly decreasing breach between "pure" and "applied" research.

Books

ROWELL, E. A., AND ROWELL, R. *On the Trail of Marihuana.* Pacific Press Pub. Association, Mountain View, California, 1939. 96 pp. Paper cover 25c. Cloth, School ed. 75c.

This inexpensive paper bound account of the history and harm done by Marihuana, "The Weed of Madness," is written in popular style by two men who have spent years investigating and lecturing on Marihuana and other narcotic drugs throughout the United States.

The general make-up of the book is attractive, and it is illustrated with good views of "Mariajuana" (*Cannabis sativa*), the weed which produces the drug known as Marihuana, growing under varied conditions. Close-ups are shown of the leaves and fruits of the plant, and of various forms in which the drug may be sold.

The subject matter traces the history of the use of the drug, its effects on various body organs, ways in which it is sold illegally, how to recognize the plants which produce it, and the social problems involved for the present and future. All phases of these subjects are well covered. Harmful effects of Marihuana cigarettes on high school boys and girls are brought to the reader's attention by vivid stories taken from real life.

The appendix contains specific identification tests for Marihuana, and a copy of the Federal Marihuana Tax Act of 1937.

This little book impresses me as being extremely valuable as reference reading for the biology classroom or school library, and might well be recommended to school organizations of pupils and parents for distribution among their numbers, particularly in localities where Marihuana has become a menace.

B. BERNARR VANCE

HEISS, ELWOOD D., OBOURN, ELLSWORTH S., AND MANZER, J. GORDON. *Our World of Living Things.* Webster Publishing Co., St. Louis, 1936. 274 pp. $1.08. (Workbook and Unit Tests available.)

The authors present an 8¾ inch by 11 inch hardcovered text with a two column layout. There are cuts and halftones. Most legends to the cuts are titles. A stimulating arrangement of problems and questions in a dark lined box is maintained throughout. The book includes index, end chapter references, summary outlines of principles, suggested pupil activities and self-mastery tests.

Unadorned language is used. There is a problem form approach. The phraseology is of a simple, straightforward, non-motivating style. The text has a unit-topic sequence of varying length. The topic "All Living Things Require Food" is completed in 31 pages while the topic of heredity has eight pages devoted to its development; five pages elaborate breeding, eugenics, euthenics; classification is treated in 24 pages; "Living Things and Their Environment Are Constantly Changing" has a seven page elaboration. The following fundamental topics are treated: classification, food, diet, digestion, circulation, excretion, ecology, behavior, reproduction, heredity, breeding, eugenics, bacteria and man, conservation, and evolution.

ALAN A. NATHANS

FOR YOUR BOOKSHELF

General Anthropology. FRANZ BOAS and Others.

A comprehensible and interesting text. In order to cover, in the best possible way, the wide field of the subject, Dr. Boas has gathered together a group of experts who discuss their own particular specialties in separate chapters. A number of different views are thus presented but these have been arranged and coordinated so that an underlying unity prevails throughout the book. D. C. Heath & Company. 1938. 718 pages. $4.00

American Conservation. Compiled and edited by OVID BUTLER.

This profusely illustrated volume presents a discussion of our natural resources, how they have been exploited and the necessity and purposes of conservation in this country. Beginning with a description of the origin of the earth, the book carries one right up to date with the story of the Civilian Conservation Corps' work in connection with conservation. The American Forestry Association. 1937. 144 pages. $2.50

An Introduction to Modern Genetics. C. H. WADDINGTON.

One of the newest books in the field. In addition to the usual discussion of the mechanics of Mendelism and the nature and workings of the chromosomes and genes, the author has included two interesting sections on "Genetics and Human affairs" and "Genectics and Evolution." Laboratory directions for class work on Drosophila are of interest to the teacher, as is a lengthy bibliography. Macmillan Company. 1939. 441 pages. $4.00

Animals Without Backbones. RALPH BUCHSBAUM.

This book should do much to dispel the idea that textbooks cannot be made fascinating reading. The language is simple and the type of printing easily readible and, in addition, the book is replete with excellent photographs and clearly executed drawings. The emphasis is distinctly not on structure but on broad life principles. University of Chicago Press. 1938. 371 pages. $3.75

The World of Insects. CARL D. DUNCAN and GAYLE PICKWELL.

The authors deserve commendation for the successful avoidance of too many technical terms. The book presents a general view of the insect world and is helped in this task by the excellent collection of illustrations (about 200 of these). The various life functions of insects are discussed as well as their social life and control. McGraw-Hill. 1939. 409 pages. $3.50

Algae: The Grass of Many Waters. LEWIS H. TIFFANY.

An attempt to describe and explain the Algae. The author advises that the book is intended for students and the general public and not for the experts. It is written from an ecological point of view in a pleasant readable style. Illustrations of Algae from all parts of the world are included. Charles C. Thomas. 1938. 161 pages. $3.50

Introduction to Animal Biology. JOHN B. PARKER–JOHN J. CLARKE.

A carefully planned elementary text which is intended to go hand in hand with a laboratory course in Zoology. In addition to the description of the various groups of animals from Protozoa upward, several chapters are included on such topics as hormones, vitamins, heredity, gametogenesis and evolution. C. V. Mosby Co. 1939. 503 pages. $3.75

Marvels of Insect Life. EDWARD STEP.

The 638 Illustrations and the wealth of material covered in this book make it a source of enjoyment and knowledge for teachers and students alike. Classification and technical details have been eliminated to a marked degree. Popular names and simple everyday language are used throughout and contribute to the charm of the volume. Robert M. McBride & Co. 1938. 486 pages. $3.75

The Principles of Insect Physiology. V. B. WIGGLESWORTH.

There are many excellent texts on entomology but most of these are concerned chiefly with the study of structure with little emphasis on function. This book, on the contrary, places its emphasis on the physiology of insects and adds just enough morphology to explain the functions. It is excellently illustrated and contains a fine bibliography. E. P. Dutton & Company. 1939. 434 pages. $8.00

Protein Metabolism in the Plant. ALBERT C. CHIBNALL.

A rather advanced text that is complete and valuable for students of this phase of plant life. The first part of the volume is devoted to an historical summary of work done in the field of protein metabolism in seedlings while the later chapters are concerned with the rôle of the leaf in protein metabolism. Yale University Press. 1939. 306 pages. $4.00

A. A. F.

NEWS OF THE LOCALS

Northern Indiana Biology Teachers Association held a very successful meeting on February 24th at Central High School in South Bend, Indiana. In spite of ice and snow, thirty-five teachers attended to hear and see an exceptional program. The display of student projects prepared by the host school was outstanding. The program of six varied papers was followed by a round table discussion. The next meeting is to be an all-day field trip on April 20th at the Jasper-Pulaski Game Farm near Knox, Indiana. All biology teachers in Northern Indiana and surrounding states are invited. For particulars write to Mr. A. B. Krom, Wabash, Ind.

San Francisco Biology Teachers to Organize. Mr. Charles C. Herbst, of Beverly Hills, California, Second Vice President of The National Association of Biology Teachers, is sponsoring a new organization in the San Francisco area. Circular letters have gone out to a great many teachers and it is expected that we will soon have a new local. Any biology teacher or member of our association who will be interested in this new local is urged to get in touch with Mr. John J. Burke, George Washington High School, 32nd Avenue and Anza Street, San Francisco, California.

The Maryland Association of Biology Teachers announces an unusually interesting program for its seventh annual meeting, to be held in Annapolis, April 27, 1940. The program follows:

Morning Session: 10:00 A.M., St. John's College.

Current Research: five short papers (20 minutes each), or presentations of their work, by teachers from five of Maryland's colleges (Western Maryland, University of Maryland, Washington College, Goucher, and Johns Hopkins University).

Talk on work of National Association of Biology Teachers by George W. Jeffers, President-elect, and tree walk around St. John's campus.

Afternoon Session: 2:00 P.M., Annapolis High School.

"Insect Vectors," F. C. Bishopp, Chief Entomologist, U. S. Department of Agriculture.

"Evolution of Arthropods. II.," R. E. Snodgrass, entomologist, U. S. Department of Agriculture and lecturer at University of Maryland.

Symposium "High School Biology," Three Contrasting Points of View: William Burnett, Teachers College, Columbia University; C. L. Benninghof, Western Maryland College; Thomas Otto, Towson High School.

Evening Session: 7:45 P.M., Annapolis High School.

"The Cancer Problem," Richard N. Spencer, U. S. Public Health Service.

Exhibits: 7:00 to 7:45 P.M., Annapolis High School.

Exhibits are by students or teachers.

Luncheon: St. John College. Remarks by Stringfellow Barr.

Dinner: Carvel Hall Ballroom. (Combination rate for the two meals, $1.00.)

NEW ENGLAND BIOLOGICAL ASSOCIATION

The New England Biological Association reports a particularly successful year of activity with new members coming in each meeting and a membership of approximately 130, representing Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island.

Officers of the association are: President, Leo J. Fitzpatrick of Brockton High School, Brockton, Mass.; Vice President, H. Anna Kennedy, South Weymouth, Mass.; Corresponding Secretary, Harriet Fogg, North High School, Quincy, Mass.; and Secretary-Treasurer, Christina B. Locke of Dorchester High School for Girls, Dorchester, Mass.

A very successful first meeting of the year was held at Waltham Field Station of the Massachusetts State College, with a program featuring improved breeding of flowers and vegetables and addresses on this work by members of the station staff. Genetical theories and their relation to the high school biology course were discussed by Dr. Edwin C. Haertl, a member of the association.

On January 20, a meeting was held at the Mass. Institute of Technology at which the president, Leo J. Fitzpatrick, reported on the meeting of the National Committee on Science Teaching held at Chicago, to which he was a delegate, and also the A.A.A.S. meeting at Columbus, Ohio, held in the latter part of December. At this meeting Dr. Irwin Whiting Sizer, Assistant Professor of Physiology at Tech, spoke on "Modern Methods in Biology for the Secondary School Teacher," Mr. Thomas W. Morrison of Milton Academy, Milton, Mass., spoke on "Present Day Trends in College Preparatory Biology" and Dr. Murray P. Horwood, Professor of Bacteriology and Public Health at Tech spoke on "The Application of Bacteriology to Sanitation and Public Health." Following a demonstration of a new type of inexpensive microprojector, the group went on a tour of the biological laboratories at Massachusetts Institute of Technology.

The New England Association has many charter members in the National Association of Biology Teachers. Leo J. Fitzpatrick

ASSEMBLY PROGRAMS

The Biology Teachers Association of New York has set aside a meeting for the discussion of the presentation of adequate assembly programs, and will be grateful for the receipt of scripts, sources of plays, or hints dealing with the presentation of scientific or biological subjects. Address Charles Tanzer, High School of Science, The Bronx, New York City. We shall be pleased to publish in THE AMERICAN BIOLOGY TEACHER material of the foregoing type which has proved to be successful.

JUNIOR AUDUBON CLUBS

Birds are migrating. Now is the time to form bird-study clubs.

Junior Audubon Clubs are sponsored by the National Association of Audubon Societies, an organization whose purpose is the protection of all forms of wildlife. A special endowment enables the Association to furnish its Junior Members with interesting material at far below cost. TEN or more children may band together to form a club in a school, Scout troop, camp or in the home neighborhood. Club dues are ten cents a member each year. Each Junior Member receives a bird button and six four-page bird leaflets with bird color plates and outline drawings to color. For other details and registration form, write to the Junior Secretary, National Association of Audubon Societies, 1006 Fifth Avenue, New York, N. Y.

THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS ☐ NEW
MR. P. K. HOUDEK, *Sec'y-Treas.* ☐ RENEWAL
ROBINSON, ILLINOIS

I hereby apply for membership in The National Association of Biology Teachers and enclose $1.00 as my annual membership dues 80c of which is for a year's subscription to The American Biology Teacher.

M

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POSITION .....

Local biology teachers association of which I am a member .....